







# Landis Expert System

*"LANDIS and HELP Model for Windows are part of the strategy that we use to help our clients with their solid waste. BetzDearborn's Environmental / Engineering Group has been involved in a number of solid waste projects where LANDIS has been an integral part of the solution. It is expected that future projects will also use this technology."*

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## THE COMPANY

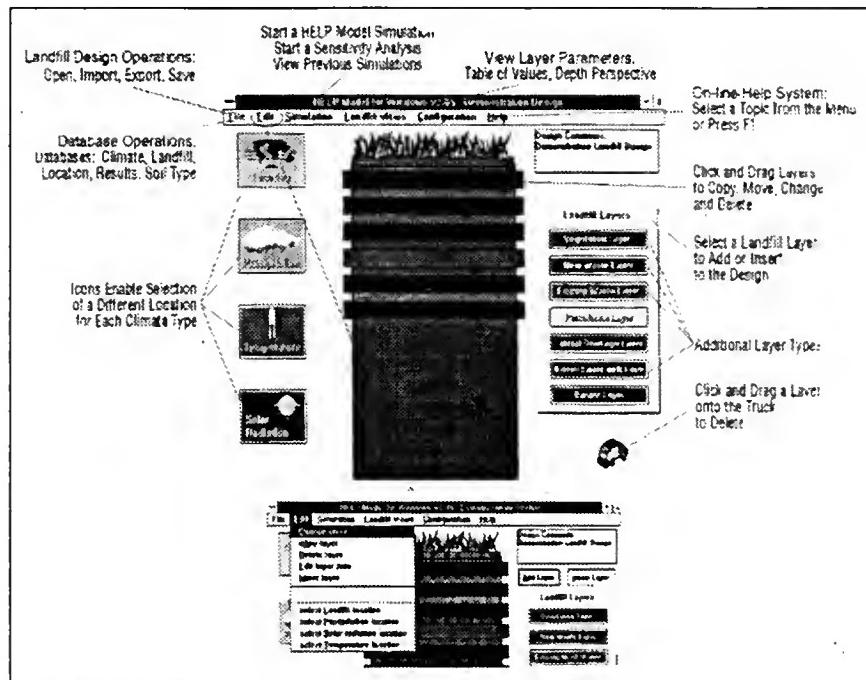
BetzDearborn Inc. is a Canadian corporation attending to water, process and wastewater concerns in industry since 1912. The company brings to its clients a wide spectrum of experience in the application of waste management strategies – from state-of-the-art techniques initiated in the laboratory to those routinely applied in the field. BetzDearborn provides water and wastewater treatment services to more than 2,000 industrial clients across Canada. The Environmental/Engineering Group, an important component of the BetzDearborn organization, provides economical solutions and ensures minimal plant and process downtime.

## THE CHALLENGE

To develop a cost effective tool for evaluating the suitability of solid wastes for landfill disposal and for comparing a variety of disposal scenarios in a quick and efficient manner.

## THE SOLUTION

The LANDIS (LAND DISposal) Expert System program is a computerized tool which permits regulatory agencies, planners, engineers and researchers to assess solid waste in ways that were not previously available to them. The system indicates



LANDIS expert system landfill design tools.

the testing requirements for solid wastes, the suitability of the wastes for landfill disposal and the treatment options for wastes failing the disposal criteria. LANDIS guides the user through a solid waste assessment by using the conventions governing leaching, the properties of waste and the hydrology of the target landfill. It incorporates and extends the HELP v2.05 landfill hydrology model for the design and assessment of a target landfill disposal site.

By managing and interpreting an extremely large and complex data set, the system considers more information on waste analyses, leaching test results and landfill disposal conditions in a waste disposal assessment than do other systems currently on the market. It also allows many different disposal scenarios to be evaluated and compared in a cost-effective manner.

## TECHNOLOGY DESCRIPTION

The LANDIS system is a MS-DOS-based PC software program that was completed in 1995. The BetzDearborn

Environmental Group uses the program in landfill design and landfill closure projects. A fully comprehensive software package for commercialization is being finalized by the company in conjunction with the Canadian Electrical Association.

The main components of the LANDIS program include: a knowledge-based expert system; databases containing results from tests indicating the characteristics of the waste, leaching tests and model simulations; a graphical user interface module; and HELP Model for Windows landfill design tool. The LANDIS program also contains an extensive on-line user's guide which explains how LANDIS works, helps the user select options and parameter values, assists in data input and describes how to perform various waste characterization and leaching tests.

HELP Model for Windows (HMfW) is a landfill design tool. Its purpose is to guide the user through the design process of an open, partially closed or closed landfill. After design comple-

tion, the program will conduct a HELP Model v2.05 water budget simulation and display the results of the simulation in graphs and tables. HMfW is used in LANDIS to allow hydrological characteristics of specific landfill designs to be incorporated into the landfill disposal assessment process.

The HELP Model for Windows program consists of: a Microsoft Windows™ graphical user interface; relational database management system for storage, retrieval and analysis of landfill designs; HELP landfill design and hydrological model computation engine (Hydrological Evaluation of Landfill Performance, ver. 2.05, USAE Waterways Experiment Station, Vicksburg, MS); and an on-line help system.

Help Model for Windows is run independently of the LANDIS program. A user can either design a new landfill or load and edit a previously saved design. The HELP model can then be run to examine the hydrological characteristics of the landfill, or the design can be saved and evaluated during a subsequent LANDIS consultation.

HELP Model for Windows v2.05 was commercially released as a stand-alone product in August 1993. National and international sales of the program are continuing. A LAN (local area network) version of HMfW was commercially available in June 1994. The LAN program extends the stand-alone version by providing: a single repository for the program and databases; "work group" editing among all users; easy node installation; and network security.

## RESULTS

Users of the system realize direct cost savings due to reduced requirements for waste analysis and testing. In addition, since all knowledge processing and data interpretation steps are available for review, LANDIS provides a strong basis for fairness, con-

sistency and co-operation between government and industry when determining the suitability of wastes for landfill disposal.

## TECHNOLOGY OPPORTUNITIES

HELP Model for Windows v2.05 is distributed in Canada by BetzDearborn. United States and international sales are distributed in partnership with Scientific Software Group, Washington DC.

The continuing sales of HELP Model for Windows v2.05 in the international markets indicates a great opportunity for HMfW and LANDIS. Upgrades to the products are being evaluated with other partners.

## PARTNERSHIP IN POLLUTION PREVENTION AND RESOURCE CONSERVATION

The demonstration of this technology was partially supported by the Ontario Ministry of the Environment. Other partners include Environment Canada's Wastewater Technology Centre, Water Technology International Corporation, Supply and Services Canada (through the Unsolicited Proposals Program) and the Canadian Electrical Association.

Industrial companies located in Ontario may seek ministry/industry services which will help them:

- \* reduce, reuse and recycle solid waste;
- \* effectively clean up historic pollution and destroy hazardous contaminants;
- \* reduce or eliminate liquid effluent and gaseous emissions;
- \* use energy and water more efficiently.

Equipment and services supply companies can benefit from the information provided on technologies identified for business development.

*This project profile was prepared and published as a public service by the Ontario Ministry of the Environment. Its purpose is to transfer information to Ontario companies about new environmental technologies.*

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